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ABSTRACT

Given the state of the art of computing in 1982, it is not necessary to know a computer language to use a computer. Three aspects of the current state of computing make it mandatory that educators from elementary through postsecondary levels rapidly incorporate this skill into the curriculum: (1) computers have permeated society--they are used in virtually every business; (2) they have begun to compete with schools for the attention of young people, as evidenced by the popularity of video games; and (3) they have potential as teaching tools. If this potential could be utilized, then the problem of the need for computing skills could be addressed early in the educational process, and educators might meet the competition of computer games. Since the individual teacher need not write computer programs, all that remains for educators is to obtain the computer and the programs and find someone who will demonstrate their use. Two invaluable resource persons are present in almost every community--the computer-knowledgeable parent, and the computer "whiz kid" from the local high school or university. The parent can give advice on obtaining computer hardware and the student can help "debug" commercial programs, as well as incorporate the instructor's ideas into programs written by others. (HOD)

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Reading, Writing and Algorithms: Computer Literacy in the Schools

by

Helen H. Neufeld

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An algorithm is a set of instructions, which may be verbal or stated in mathematical terms, for carrying out a repetitive or routine process. The process for calculating square root, included in elementary mathematics instruction in the years b. c. (before calculators), is an example of an algorithm: (1) Write the number, including the appropriate number of decimal places; (2) Mark groups of two digits, starting at the decimal point and going to the right and left; (3) Take the square root of the first set of digits..., and so on, ad infinitum.

Calculators the size of credit cards now carry out this process and other mathematical feats because a person, a programmer, has written a set of algorithmic commands in one of many "languages" which translate word instructions into a set of mathematical operations performed in sequence.

The matter of language was the foremost problem of computing in the early 1950s. Only relatively few technologists understood the machine language needed to communicate with the computer. Consequently, a communication barrier resulted between the computer user and the instrument. As early as 1949 a noted linguist, Mario Pei, was seriously proposing a worldwide "interlanguage" which could be electronically

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transmitted. He wrote, "In the world of tomorrow...even the obdurate stay-at-homes will get standardized interlanguage radio, television and movie programs" (Pei, 1949, p. 399). It is not known whether the proposal of Pei and other linguists influenced the would-be inventors of computer languages.

In any event, by 1954, after several earlier unsuccessful efforts had failed, a computer language had been developed with which a person who was not a trained programmer could communicate instructions to a computer. Called FORTRAN (Formula Translation), it was developed by International Business Machines but was not patented, in the hope that it would be widely used. Although this was the case it did not become the worldwide "interlanguage" of computers--by 1965 there were approximately 1700 specialized computer languages (Time, 1965, p. 87). A present-day enumeration would be difficult, since countless languages have now been formulated by universities and corporations for use in specialized settings. MAD (the Michigan Algorithmic Decoder), JOVIAL (Jule's Own Version of the International Algebraic Language), MIDAS (Microscopic Image Digital Attribute System) and, inevitably, SECS (Simulation and Evaluation of Chemical Synthesis) are examples of these sometimes whimsically named languages.

At about the time of the development of computer languages which were manageable by the non-computer scientist on the university faculty, another academic discipline experienced a major event. Reinforcement theory was at its zenith in the field of educational psychology, and in 1954 a noted proponent of this theory, B. F. Skinner, published a

widely acclaimed article on the use of mechanical devices in teaching (Skinner, 1954, pp. 86-97). These two new concepts, computer languages for the non-scientist and reinforcement theory, were later to converge in the development of computer-assisted learning.

Given the state of the art of computing in 1982, it is not necessary to know a computer language to use a computer. Many computers and computer-like devices have been pre-programmed to carry out a series of algorithmic processes at the touch of a single button or typewriter-like key. One of these pre-programmed devices, measuring $2\frac{1}{2}$ by 4 inches, is a standard credit-card size calculator, but it will also play a tune of the user's own composition; play any of eight pre-programmed tunes on a day and time of the user's choice; remind the bearer of an anniversary, birthday or Christmas shopping by playing an appropriate melody every hour on a pre-set day; function as a stopwatch and time laps for athletic events; and serve as a digital clock and calendar.

A hand-held electronic game, Merlin, approximately1 by 3 by 8 inches in size, has been pre-programmed to play games of skill, test tonal memory, play back melodies of the user's own composition, and challenge the user's ability to use logic in decoding number sequences chosen by the device itself.

What Does This Have to Do With the Schools?

Three aspects of the current state of computing make it mandatory that educators from elementary through post-secondary levels rapidly incorporate this skill into the curriculum: (a) Computers have permeated society. They are used in every business, public service and

institution. It is predicted by Andrew Molnar, Director of Science Education of the National Science Foundation, that by 1985 there will be five times the present need for computer skills (Molnar, 1977, p. 39); (b) Computers have begun competing with schools for the attention of young people. A recent magazine article, "Gronk! Flash! Zap! Video Games Are Blitzing the World," describes the addictive quality of these games which have made school seem tame indeed for many adolescents (Time, 1-18-82); (c) The computer has potential as a teaching tool. If this potential could be utilized, then the problem of the need for computing skills could be addressed early in the educational process, and the competition of computer games might be met.

A cursory observation of children at play with the computer shows that they are challenged, in a non-judgmental, non-threatening situation, to improve--to improve their score, their response time, or their memory for a pattern, a melody, or a number sequence. A good computer game rewards success. It is consistent, and it is available at the player's convenience. Research is needed to answer the question of how best to channel this appeal of computer games for educational purposes.

Donald Michael states in The Unprepared Society that there is a growing separation between those whose work involves creative tasks using the computer and the rest of the population. He feels that "...ignorance of computers will render people as functionally illiterate as ignorance of reading, writing and arithmetic" (Michael, 1968).

Many teachers argue that the school is already overburdened--that computer literacy is the responsibility of the individual, and

can be developed in leisure time or after leaving school. Concerning this, Andrew Molnar writes:

> Imagine the engineer who graduates with honors but has not been exposed to computers and must compete for a job in industry, now permeated with computers. Imagine the drill-press operator who graduates from a vocational school only to discover that machinists in modern factories don't use machines but instead program computers to run machines. A student who graduates without being exposed to computers has had an incomplete education. To retrain after graduation creates an unnecessary human waste and incurs a high, unacceptable social and psychological cost (Molnar, 1978).

How Can A Teacher Fit Computing IN?

This question is asked by already overscheduled elementary teachers who must deal with milk money, bus duty and mandated programs of all kinds. Dr. Seymour Papert of the Massachusetts Institute of Technology suggests that computing be used to introduce new ways of thinking in mathematics, physics, geometry and physiology. He has shown that young elementary school children are capable of writing computer-based poetry and music. In describing Papert's work, Molnar (1978) points out that it is significant because it demonstrates that today's curriculum greatly underestimates the capacity of children to deal with complexity and arbitrarily postpones the introduction of problem-solving skills to a point so late in the curriculum that most children lose interest or become so dependent on guidance that they never master these skills. Computing

provides a new way of thinking and as such should be introduced as early as possible. The power of the computer eliminates many manual skills that are prerequisite to mastery and provides a powerful, general problem-solving tool that permits students to cope with complex problems.

But I Can't Write Computer Programs!

Writing of computer programs by the individual teacher is not necessary or even desirable, given the fact that commercial enterprises have gotten such efforts well underway. All that remains for the individual teacher is to obtain the computer (usually a microcomputer system costing under $3000.00), obtain the programs, and find someone who will demonstrate their use.

Two invaluable resource persons are present in almost every community, and are available with a few telephone calls--the computer-knowledgeable parent, and the sophomore computer whiz from the local high school. The parent who is a computer engineer or who works with computers daily in some capacity can offer much help and advice in obtaining computer hardware--both in educating a school board and administration with regard to the needs for and types of equipment, and in the physical process of getting the system in operation.

The high school student who has played with computers from the age of ten or so is usually delighted to be asked to share his knowledge. In the community college where the author is an instructor, three of these computer buffs--college freshman students with several years of

experience in computing--were employed at low cost to rewrite and debug commercial programs, as well as incorporating the instructor's ideas into programs written by themselves. One elite institution, Mills College, Oakland, California, has recruited computer-knowledgeable college students as tutors for faculty members who wish to learn computing and incorporate it into their teaching (Lennox, 1979).

What Computer Materials are Available and Where?

Computer-assisted instruction programs are available in music, dance, foreign language, theatre, English composition and, as would be expected, in mathematics and science. The social studies have not been neglected. Elementary school economics is taught with the aid of such games as Lemonade Stand and Apple Stand, in which the student is given various costs of operation for his commercial enterprise and has the task of determining a best selling price for his product. The Oregon Trail presents maps, facts about terrain to be encountered, hazards and resources along the way, and leads the student through the geography of a large section of the United States.

Information on such programs, however, is so new that it is not yet available in a compendium for easy reference. It may be obtained from free materials or from a visit to a large university library. Some sources are listed in the following pages.

There is a German proverb, "Alle anfang ist schwer."--all beginnings are difficult. It is the difficult task of education to begin to adapt to the changes wrought in our society by the advent of computing, and to use the computer as it will typically be used in students' future careers.

Getting Started in Classroom Computing:

Some Sources of Information

1. Albrecht, R. L., Finkel, L. R., Brown, J. R. Basic: A Self Teaching Guide. Second Edition. New York: Wiley and Sons, 1978.

2. Assessment and documentation of a children's computer laboratory. (A NSF funded project.) Contact Dr. Seymour A. Papert, Massachusetts Institute of Technology, Cambridge, Mass. 20139.

3. Community Computer Center, Menlo Park, CA 94025. Contact Joanne Verplank, 1919 Menalto Ave., Menlo Park, CA 94025.

4. Creative Computing, P. O. Box 789M, Morristown, N. J. 07690.

5. Grinstein, Louise and Yarmish, Rita. The computer in education: myth and reality. Educational Horizons (the official publication of Pi Lambda Theta), Summer, 1981. Contains an extensive reference list.

6. "In Julie Chan's Classroom, Playing With Computers Is Kid Stuff," People magazine, October 12, 1981.

7. Lawrence Hall of Science. Contact Bob Kahn, Computer Education Project, Lawrence Hall of Science, University of California at Berkeley, Berkeley, CA 94720.

8. LOGO (a computer language for education). Contact Dr. Wallace Feurzeig, Bolt, Beranek and Newman, Inc., Cambridge, Mass 02101.

9. Model secondary school for the deaf. Contact Paul Watson, Director, Division of Curriculum Development, Gallaudet College, Kendall Green, Washington, D. C. 20002.

10. National Science Foundation Directorate for Science Education, Washington, D. C. 20550.

11. Pipeline. Fall, 1981, Volume 6, Number 2. (A special issue of this educational computing journal devoted to basic skills in music, foreign language, dance, theatre, mathematics, English composition and science laboratory simulation.) The University of Iowa, Iowa City, Iowa 52242.

12. Teaching Resources Center, University of California at Davis, Davis, CA 95616.

13. What to do After You Hit Return. Peoples Computer Co., Menlo Park, CA 94025.

14. Zeddies, M. L., et al, Individualized Instruction for Gifted Students Using Computer Time-Share Systems. San Diego: San Diego City Schools, 1974.

List of References

Lennox, Carol, Director, Computing Activity, Mills College, Oakland, CA. Address at EDUCOM Conference, October 30, 1979.

Michael, Donald N., The Unprepared Society. New York: Basic Books, 1968.

Molnar, Andrew R. National policy toward technological innovation and academic computing. The Journal: Technological Horizons in Education. Vol. 4, No. 6, 1977, pp. 39-43.

Molnar, Andrew R. The next great crisis in American education: computer literacy. Invited paper, Annual Conference, Society for Applied Learning Technology, Orlando, Florida, February 16, 1978.

Pei, Mario. The Story of Language. New York: Mentor Books, 1949.

Skinner, B. F. The science of learning and the art of teaching. Harvard Educational Review, 24, 1954, 86-97.

Time. Games that play people. January 18, 1982, pp. 50-58.

Time. The cybernated generation. April 2, 1965, pp. 84-88.